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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/498,012	02/04/2000	Craig M. Jarchow	APA-001	8206

7590 03/26/2003

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EXAMINER
DAY, HERNG DER

ART UNIT	PAPER NUMBER
2123	4

DATE MAILED: 03/26/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary	Application No.	Applicant(s)	
	09/498,012	JARCHOW, CRAIG M.	
	Examiner	Art Unit	
	Herng-der Day	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 February 2000* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *04 February 2000* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

1. Claims 1-25 have been examined and claims 1-25 have been rejected.

Drawings

2. The drawings are objected to for the following reasons. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

2-1. The Draftsperson has objected to the drawings; see the copy of Form PTO 948 for an explanation.

2-2. Figures 1-2 and 4 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g).

Specification

3. The disclosure is objected to because of the following informalities:

Appropriate correction is required.

3-1. It appears that the legend of equation 1, as described in lines 7-10 of page 2, is not consistent.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-7, 13-20, and 24-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Partyka et al., U.S. Patent 6,131,071 issued October 10, 2000, and filed January 19, 1999, in view of Cox et al., "Maximum Entropy Analysis of Dispersed Seismic Signals", Geophysics, Vol. 51, No. 12, December 1986, pages 2225-2234.

5-1. Regarding claims 1 and 13-14, Partyka et al. disclose a method of processing a group of spatially related seismic data traces (abstract; and summary, column 7, line 9, through column 11, line 7), comprising:

defining seismic data windows extending over selected portions of said group of spatially related seismic data traces (transform window, column 17, lines 36-57);

generating a frequency spectrum of the seismic data within successively selected windows of said seismic data traces by applying a transform to said successively selected windows (discrete Fourier transform, column 7, lines 10-13); and

utilizing said frequency spectra to generate data related to the location of thin beds in the earth's subsurface (to image and map the extent of thin beds, column 7, lines 10-13).

Partyka et al. fail to expressly disclose the transform having poles on the unit z-circle, where z is the z-transform. Nevertheless, Partyka et al. suggest that a wide variety of discrete data transformations other than the Fourier (column 38, lines 13-24) can be used to identify thin bed effects.

Cox et al. disclose "maximum entropy power spectral analysis eliminates the resolution constraints imposed by convolution of window's Fourier transform with the spectrum of the

trace segment" (Cox, page 2225, column 2, paragraph 3). In other words, using maximum entropy method will enhance the resolution of a moving-window analyzer. Specifically, Cox et al. disclose the missing element that the transform having poles on the unit z-circle, where z is the z-transform.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Partyka et al. to incorporate the teachings of Cox et al. to obtain the invention as specified in claims 1 and 13-14 because by using maximum entropy method to replace Fourier transform, the resolution of a moving-window analyzer will be enhanced (Cox, abstract).

5-2. Regarding claims 2-7, Partyka et al. disclose the construction of a 3-D volume and the calculation of various seismic attributes, including location of maximum frequency and the amplitude at the maximum frequency (column 31, line 17, through column 32, line 56), which meet all the claimed limitations.

5-3. Regarding claim 15, Partyka et al. disclose a method of processing a group of spatially related seismic data traces (abstract; and summary, column 7, line 9, through column 11, line 7), comprising:

defining seismic data windows extending over selected portions of said group of spatially related seismic data traces (transform window, column 17, lines 36-57);

determining the frequency value of the frequency component having the greatest amplitude within each said frequency spectrum (location of maximum frequency, column 31, lines 54-57; and Fig. 14); and

utilizing said frequency values to generate data related to the location of thin beds in the earth's subsurface (to image and map the extent of thin beds, column 7, lines 10-13);

Partyka et al. fail to expressly disclose applying a maximum entropy transform to said successively selected windows. Nevertheless, Partyka et al. suggest that a wide variety of discrete data transformations other than the Fourier (column 38, lines 13-24) can be used to identify thin bed effects.

Cox et al. disclose "maximum entropy power spectral analysis eliminates the resolution constraints imposed by convolution of window's Fourier transform with the spectrum of the trace segment" (Cox, page 2225, column 2, paragraph 3). In other words, using maximum entropy method will enhance the resolution of a moving-window analyzer. Specifically, Cox et al. disclose the missing element of applying a maximum entropy transform to said successively selected windows.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Partyka et al. to incorporate the teachings of Cox et al. to obtain the invention as specified in claim 15 because by using maximum entropy method to replace Fourier transform, the resolution of a moving-window analyzer will be enhanced (Cox, abstract).

5-4. Regarding claim 16, Partyka et al. further disclose that said data comprises a substantially horizontal cross-section of a three-dimensional volume of seismic data (Fig. 14; and 3-D volume, column 31, lines 29-52).

5-5. Regarding claim 17, Partyka et al. further disclose said method is implemented on a digital computer and comprises all limitation steps as shown in Fig. 8 and Fig. 14. However,

Partyka et al. fail to expressly disclose calculating coefficients for the maximum entropy transform. Nevertheless, Partyka et al. suggest that a wide variety of discrete data transformations other than the Fourier (column 38, lines 13-24) can be used to identify thin bed effects.

Cox et al. disclose "maximum entropy power spectral analysis eliminates the resolution constraints imposed by convolution of window's Fourier transform with the spectrum of the trace segment" (Cox, page 2225, column 2, paragraph 3). In other words, using maximum entropy method will enhance the resolution of a moving-window analyzer.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Partyka et al. to incorporate the teachings of Cox et al. to obtain the invention as specified in claim 17 because by using maximum entropy method to replace Fourier transform, the resolution of a moving-window analyzer will be enhanced (Cox, abstract).

5-6. Regarding claim 18, Partyka et al. disclose a method of processing a group of spatially related seismic data traces (abstract; and summary, column 7, line 9, through column 11, line 7), comprising:

defining seismic data windows extending over selected portions of said group of spatially related seismic data traces (transform window, column 17, lines 36-57);

determining the greatest amplitude of the frequency components within each said frequency spectrum (the amplitude at the maximum frequency, column 31, lines 57-59); and

utilizing said amplitudes to generate data related to the location of thin beds in the earth's subsurface (to image and map the extent of thin beds, column 7, lines 10-13);

Partyka et al. fail to expressly disclose applying a maximum entropy transform to said successively selected windows. Nevertheless, Partyka et al. suggest that a wide variety of discrete data transformations other than the Fourier (column 38, lines 13-24) can be used to identify thin bed effects.

Cox et al. disclose "maximum entropy power spectral analysis eliminates the resolution constraints imposed by convolution of window's Fourier transform with the spectrum of the trace segment" (Cox, page 2225, column 2, paragraph 3). In other words, using maximum entropy method will enhance the resolution of a moving-window analyzer. Specifically, Cox et al. disclose the missing element of applying a maximum entropy transform to said successively selected windows.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Partyka et al. to incorporate the teachings of Cox et al. to obtain the invention as specified in claim 18 because by using maximum entropy method to replace Fourier transform, the resolution of a moving-window analyzer will be enhanced (Cox, abstract).

5-7. Regarding claim 19, Partyka et al. further disclose that said data comprises a substantially horizontal cross-section of a three-dimensional volume of seismic data (3-D volume, column 31, lines 29-52).

5-8. Regarding claim 20, Partyka et al. further disclose said method is implemented on a digital computer and comprises all limitation steps as shown in Fig. 8 and in column 31, lines 57-59. However, Partyka et al. fail to expressly disclose calculating coefficients for the maximum entropy transform. Nevertheless, Partyka et al. suggest that a wide variety of discrete data

transformations other than the Fourier (column 38, lines 13-24) can be used to identify thin bed effects.

Cox et al. disclose "maximum entropy power spectral analysis eliminates the resolution constraints imposed by convolution of window's Fourier transform with the spectrum of the trace segment" (Cox, page 2225, column 2, paragraph 3). In other words, using maximum entropy method will enhance the resolution of a moving-window analyzer.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Partyka et al. to incorporate the teachings of Cox et al. to obtain the invention as specified in claim 20 because by using maximum entropy method to replace Fourier transform, the resolution of a moving-window analyzer will be enhanced (Cox, abstract).

5-9. Regarding claim 24, this device claim performs the process of claim 1 and is unpatentable using the same analysis of claim 1.

5-10. Regarding claim 25, Partyka et al. further disclose said device is selected from the group consisting of a magnetic tape, a magnetic disk, and an optical disk (by using a magnetic disk, by type, by optical disk, column 16, lines 15-20).

6. Claims 8-12 and 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combined teachings of Partyka et al., U.S. Patent 6,131,071 issued October 10, 2000, and filed January 19, 1999, and Cox et al., "Maximum Entropy Analysis of Dispersed Seismic Signals", Geophysics, Vol. 51, No. 12, December 1986, pages 2225-2234, and further in view of Kern et al., U.S. Patent 4,665,390 issued May 12, 1987.

6-1. Regarding claims 8-10, Partyka et al. further disclose utilizing the frequency spectrum or components to generate data related to the location of thin beds in the earth's subsurface (to image and map the extent of thin beds, column 7, lines 10-13). However, Partyka et al. fail to expressly disclose determining whether the peakedness or kurtosis of said frequency spectrum exceeds a selected value.

Kern et al. disclose techniques to measure the randomness of sampled data (Kern, column 3, line 1, through column 6, line 62). Specifically, "kurtosis is a measure of how the collection of data is concentrated about its mean" (Kern, column 3, lines 50-53). "For example, a waveform with a few large, narrow peaks, but most of its information concentrated near zero, could have a large kurtosis due to the fourth power effect of the large peaks" (Kern, column 6, lines 45-48).

To generate data related to the location of thin beds from the frequency spectrum, one of ordinary skill in the art would be motivated to apply the teachings of Kern et al. to calculate the kurtosis in order to decide whether any interference has been existed due to the thin bed effect. A small kurtosis means trace data are come from the same interface without interference or with undetectable interference, i.e., no enough information about the thin bed effect. Therefore, one of ordinary skill in the art would utilize the frequency spectrum or components to generate data related to the location of thin beds only when kurtosis of said frequency spectrum exceeds a selected value to increase the process efficiency and avoid any nonsense calculation.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the combined teachings of Partyka et al. and Cox et al. to incorporate the teachings of Kern et al. to obtain the invention as specified in claims 8-10 because by

determining whether the kurtosis of said frequency spectrum exceeds a selected value will increase the process efficiency and avoid any nonsense calculation in generating data related to the location of thin beds.

6-2. Regarding claim 11, Partyka et al. further disclose that said data comprises a three-dimensional volume of seismic data (3-D volume, column 31, lines 29-52).

6-3. Regarding claim 12, Partyka et al. further disclose generating a substantially vertical cross-section of said seismic data to depict the location of thin beds (to image and map the extent of thin beds, column 7, lines 10-13).

6-4. Regarding claim 21, the combined teachings of Partyka et al. and Cox et al. meet all the claimed limitations except (1) calculating kurtosis; (2) determining if the kurtosis of each said frequency spectrum exceeds a selected value of kurtosis; and (3) generating data related to the location of thin beds if the kurtosis value exceeds a selected value.

Kern et al. disclose techniques to measure the randomness of sampled data (Kern, column 3, line 1, through column 6, line 62). Specifically, "kurtosis is a measure of how the collection of data is concentrated about its mean" (Kern, column 3, lines 50-53). "For example, a waveform with a few large, narrow peaks, but most of its information concentrated near zero, could have a large kurtosis due to the fourth power effect of the large peaks" (Kern, column 6, lines 45-48).

To generate data related to the location of thin beds from the frequency spectrum, one of ordinary skill in the art would be motivated to apply the teachings of Kern et al. to calculate the kurtosis in order to decide whether any interference has been existed due to the thin bed effect. A small kurtosis means trace data are come from the same interface without interference or with

undetectable interference, i.e., no enough information about the thin bed effect. Therefore, one of ordinary skill in the art would utilize the frequency spectrum or components to generate data related to the location of thin beds only when kurtosis of said frequency spectrum exceeds a selected value to increase the process efficiency and avoid any nonsense calculation.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the combined teachings of Partyka et al. and Cox et al. to incorporate the teachings of Kern et al. to obtain the invention as specified in claim 21 because by determining whether the kurtosis of said frequency spectrum exceeds a selected value will increase the process efficiency and avoid any nonsense calculation in generating data related to the location of thin beds.

6-5. Regarding claim 22, Partyka et al. further disclose that said data related to the location of thin beds comprises a substantially vertical cross-section of a three-dimensional volume of seismic data (3-D volume, column 31, lines 29-52).

6-6. Regarding claim 23, the combined teachings of Partyka et al. and Cox et al. meet all the claimed limitations as shown in Fig. 8 and Fig. 14, except (1) calculating kurtosis; (2) determining whether said calculated kurtosis exceeds a preselected kurtosis value.

Kern et al. disclose techniques to measure the randomness of sampled data (Kern, column 3, line 1, through column 6, line 62). Specifically, "kurtosis is a measure of how the collection of data is concentrated about its mean" (Kern, column 3, lines 50-53). "For example, a waveform with a few large, narrow peaks, but most of its information concentrated near zero, could have a large kurtosis due to the fourth power effect of the large peaks" (Kern, column 6, lines 45-48).

To generate data related to the location of thin beds from the frequency spectrum, one of ordinary skill in the art would be motivated to apply the teachings of Kern et al. to calculate the kurtosis in order to decide whether any interference has been existed due to the thin bed effect. A small kurtosis means trace data are come from the same interface without interference or with undetectable interference, i.e., no enough information about the thin bed effect. Therefore, one of ordinary skill in the art would utilize the frequency spectrum or components to generate data related to the location of thin beds only when kurtosis of said frequency spectrum exceeds a selected value to increase the process efficiency and avoid any nonsense calculation.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the combined teachings of Partyka et al. and Cox et al. to incorporate the teachings of Kern et al. to obtain the invention as specified in claim 23 because by determining whether the kurtosis of said frequency spectrum exceeds a selected value will increase the process efficiency and avoid any nonsense calculation in generating data related to the location of thin beds.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Reference to Dwyer, U.S. Patent 4,530,076 issued July 16, 1985, is cited as disclosing a method for discriminating against non-Gaussian noise.

Reference to Marple Jr., "Frequency Resolution of Fourier and Maximum Entropy Spectral Estimates", Geophysics, Volume 47, No. 9, September 1982, pages 1303-1307, is cited as comparing frequency resolution.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Herng-der Day whose telephone number is (703) 305-5269. The examiner can normally be reached on 8:30 - 17:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin J Teska can be reached on (703) 305-9704. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 746-7239 for regular communications and (703) 746-7238 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

Herng-der Day
March 24, 2003

KEVIN J. TESKA
SUPERVISORY
PATENT EXAMINER